LANDFIRE Biophysical Setting Model

Biophysical Setting **7316141** **Western North American Boreal Montane Floodplain Forest and Shrubland - Boreal**

☐ *This BPS is lumped with:*

☑ *This BPS is split into multiple models:* *Western North American Boreal Montane Floodplain Forest and Shrubland was split into a boreal and sub-boreal variant for BpS modeling so that regional differences could be represented.*

General Information

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Vegetation Type

Forest and Woodland

Map Zone

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Model Zone

☑ Alaska
☐ California
☐ Great Basin
☐ Great Lakes
☐ Northeast
☐ Northern Plains
☐ N-Cent.Rockies
☐ Pacific Northwest
☐ South Central
☐ Southeast
☐ S. Appalachians
☐ Southwest

Dominant Species*

POBAB2 SHCA
PIGL ROAC
ALNUS VIED
SALIX EQUIS

General Model Sources

☑ Literature
☐ Local Data
☑ Expert Estimate

Geographic Range

This type occurs on floodplains throughout the boreal region of AK.

Biophysical Site Description

The following information was taken from the draft Boreal Ecological Systems description (NatureServe 2008):
The substrate is typically well-drained sand or cobble, although finer silts and clays can be found on higher terraces, in ponds, on distal floodplains, and in lower energy systems. Permafrost is usually absent. Oxbows and other wet depressions commonly form on the floodplains, and these sites commonly develop into wetlands.

Vegetation Description

Primary succession on floodplains begins when new alluvial surfaces are colonized by tree, shrub and herbaceous species. Common early seral woody species include Populus balsamifera (seedlings), Picea glauca (seedlings), Alnus viridis ssp. sinuata, Alnus incana ssp. tenuifolia, Salix barclayi and Salix alaxensis (Boggs 2000, Scott 1974, Shephard 1995, Thilenius 1990, Viereck 1966). Common early seral herbaceous species may include Lupinus spp., Hedysarum spp. and Equisetum spp. (NatureServe 2008). The next seral stage includes communities dominated by Populus balsamifera and/or Picea glauca with an understory of Alnus viridis ssp. sinuata, Salix spp. and bryophytes. On dry sites the shrub layer may be dominated by Shepherdia canadensis, Dryas octopetala, D. integrifolia and fruticose lichens

*Dominant Species are from the NRCS PLANTS database. To check a species code, please visit http://plants.usda.gov.
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(Steroucaulon spp.) (NatureServe 2008). The tall shrub component of the early successional stages diminishes rapidly, probably because of decreased light from the dense tree overstory. Populus balsamifera does not regenerate in the understory and consequently, Picea glauca gains dominance in the overstory within 150yrs (NatureServe 2008). Rosa acicularis and Viburnum edule are common understory shrubs on older surfaces.

Disturbance Description

The following information was taken from the draft Boreal Ecological Systems description (NatureServe 2008):
Flooding is the primary disturbance in this system. Flooding can be caused by snowmelt, precipitation, ice jams and glacial runoff. Different rivers or portions of rivers may be more prone to certain types of flooding. Frequent flooding and channel migration create a pattern of gravel bars and early successional stages across the valley bottom. Sediment deposition raises the surface of the floodplain over time. As the terrace becomes farther removed from the channel, flooding becomes less frequent. Water availability on terraces plays a major role in community structure and composition. Water inputs are from overbank flow (flooding), ground water and precipitation. Deposits with high permeability become progressively drier as they are vertically and horizontally removed from the active channels.

Vegetation succession on gravel bars can be represented by the following seral stages: barren or herbaceous, willow or willow-alder, alder, poplar or spruce poplar, spruce. Oxbows and other wet depressions commonly form on the floodplains, and develop into wetlands. Succession and species composition is, however, variable due to diverse environmental conditions such as water depth, substrate and nutrient input.

The following information was taken from the Riparian Spruce Hardwood Potential Natural Vegetation Group (PNVG) model (Murphy and Witten 2006):
Estimates of mean fire return intervals include:
-200yrs+ (200-300yr range) (Viereck 1973, Barney 1971)
-300yrs (Rowe et al 1974) (for alluvial white spruce MacKenzie River Valley)
-300yrs (Heinselman 1981)
-300yrs (Duchesne and Hawkes 2000)
-300yrs (personal communication experts' workshop March 2004)

Small, relatively infrequent, mixed severity fires characterize this PNVG due to the sites' proximity to rivers, which act as fire breaks (Viereck 1973, Barney 1971, Foote 1983). High moisture content of the vegetation, high percentage of deciduous species, and high relative humidity also contribute to making fires less frequent in the Riparian Spruce Hardwood PNVG than in typically adjacent PNVGs. In interior AK the oldest white spruce stands (350yrs+) are commonly found on islands of floodplains where they are protected from fire (Viereck 1973).

Adjacency or Identification Concerns

This model applies to forest and shrub systems in the active and inactive portions of the floodplain, but not abandoned floodplains. Oxbows and other wet depressions commonly form on the floodplains. Floodplain Wetlands are a separate ecological system and a separate BpS.

Native Uncharacteristic Conditions

Scale Description

Linear.

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Issues/Problems

Wetlands that occur on the floodplain are not considered in this model.

Comments

This model was based on the FRCC Guidebook PNVG model for Riparian Spruce Hardwood (RSH; Murphy and Witten 2006) and input from the experts who attended the LANDFIRE Fairbanks (Nov. 07) modeling meeting. It was refined by Michelle Schuman. The relative age function used in the RSH model was not used in any class except A to comply with LANDFIRE modeling rules and the 10,000yr replacement fire was removed from class D. These changes did not change the model results. Because changes to the VDDT model were relatively minor Karen Murphy and Evie Witten were retained as modelers and Michelle Schuman's name was added.

Vegetation Classes

Class A 5 %

Early Development 1 All Structures

Upper Layer Lifeform

- [ ] Herbaceous
- [x] Shrub
- [ ] Tree

Indicator Species* and Canopy Position

LUPIN	Upper
HEDYS	Upper
EQUIS	Upper
SALIX	Upper

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	Open Shrub (25-74% shrub cover)	Open Shrub (25-74% shrub cover)
Height	Dwarf Shrub (< 20 cm)	Tall Shrub (>1.5 m)
Tree Size Class	Seedling/Sapling <5"	

- [ ] Upper layer lifeform differs from dominant lifeform.

Description

0-4yrs

This class is characterized by post disturbance regeneration (herbs, shrub regeneration and seedlings). Silt is deposited on the inside of river meanders following flood events. Flooding deposits seeds which germinate and take root. Lupinus spp., Hedysarum spp., Equisetum spp. and Salix spp. colonize in the first year. Within five years Salix spp and balsam poplar seedlings are abundant. Plant cover is 1-2% first year. Shrub cover increases up to 40% by the fifth year, with a diverse herbaceous layer underneath. Occasionally white spruce will germinate in large numbers on mineral soil after flooding, resulting in a dense, even-aged stand and eventual succession to class E (via class B).

Succession to class B. Flooding (probability = 0.05), represented by Option 1 in the model, resets the age of this class.

Class B 20 %

Mid Development 1 Closed

Upper Layer Lifeform

- [ ] Herbaceous
- [x] Shrub
- [ ] Tree

Indicator Species* and Canopy Position

SALIX	Upper
ALNUS	Upper
POBAB2	Upper
ROAC	Lower

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	Closed Shrub (> 75% shrub cover)	Closed Shrub (> 75% shrub cover)
Height	Low Shrub (20 cm to 1.5 m)	Tall Shrub (>1.5 m)
Tree Size Class	Seedling/Sapling <5"	

- [ ] Upper layer lifeform differs from dominant lifeform.

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Description

5-29yrs

Tall shrubs (Salix spp., Alnus spp.) and saplings with a closed canopy (>60%). Saplings may consist of balsam poplar with white spruce in the understory (succession to class C), or saplings may consist of pure, even-aged spruce (succession to class E). Saplings overtop shrubs at 20-40yrs, when shade-intolerant pioneer shrub species decline and shade-tolerant shrubs (Rosa acicularis (prickly rose), Viburnum edule (high bushcranberry) become more common and have a canopy cover of 10%.

Succession to class C or E. The deterministic succession pathway is to class C. The alternate succession pathway to E (probability = 0.01) represents possibility that white spruce will germinate in large numbers on mineral soil after flooding, resulting in a dense, even-aged stand. Flooding (probability = 0.03), represented by Option 1 in the model, causes a transition to class A.

Class C **40 %**

Mid Development 1 Open

Upper Layer Lifeform

- [ ] Herbaceous
- [ ] Shrub
- [x] Tree

Indicator Species* and Canopy Position

POBAB2	Upper
PIGL	Middle
ROAC	Lower
VIED	Lower

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	Closed (60-100% tree cover)	Closed (60-100% tree cover)
Height	Tree (> 3 m)	Tree (> 3 m)
Tree Size Class	Pole 5–9" (swd)/5–11" (hwd)	

- [ ] Upper layer lifeform differs from dominant lifeform.

For mapping, absence of spruce in the overstory distinguishes class C from class E.

Description

30-149yrs

Closed balsam poplar forest. Balsam poplar is the dominant overstory species but white spruce is commonly in the understory. Shade-tolerant shrub species persist in the understory. If spruce is present, at approximately 100-150yrs the transition from balsam poplar to white spruce dominance begins (succession to class D). If white spruce is not present poplar persists, the stand ages and individual trees are lost to wind, disease or rot. Shrub cover commonly increases as the overstory canopy declines.

Succession to class D. Flooding (probability = 0.01), represented by Option 1 in the model, causes a transition to class A. Mixed fire (MFRI = 400yrs) maintains this class.

Class D **25 %**

Late Development 1 Open

Upper Layer Lifeform

- [ ] Herbaceous
- [ ] Shrub
- [x] Tree

Indicator Species* and Canopy Position

PIGL	Upper
ROAC	Lower
VIED	Lower
	Lower

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	Open (25-59% tree cover)	Open (25-59% tree cover)
Height	Tree (> 3 m)	Tree (> 3 m)
Tree Size Class	Pole 5–9" (swd)/5–11" (hwd)	

- [ ] Upper layer lifeform differs from dominant lifeform.

Description

150yrs+

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Open white spruce forest. Spruce gains dominance over poplar and a mixed age, open stand develops. If enough young spruce establishes as poplar declines, the canopy closes again (modeled as alternate succession to class E). Alternatively, the stand may remain open with shrubs in the understory.

This class can persist in the absence of disturbance or follows an alternate succession pathway to E (probability = 0.005). Flooding (probability = 0.005), represented by Option 1 in the model, causes a transition to class A. Mixed fire (MFRI = 155yrs) causes a transition to class C.

Class E **10 %**

Late Development 1 Closed

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☑ Tree

Indicator Species* and Canopy Position

PIGL	Lower
ROAC	Lower
VIED	Lower
	Lower

Structure Data (for upper layer lifeform)

	Min	Max
Cover	Closed (60-100% tree cover)	Closed (60-100% tree cover)
Height	Tree (> 3 m)	Tree (> 3 m)
Tree Size Class	Med. 9–20" (swd)/11–20" (hwd)	

☐ Upper layer lifeform differs from dominant lifeform.

For mapping, dominance of spruce in the overstory distinguishes class E from class C.

Description

30yrs+

Closed white spruce forest. These stands may be even-aged (resulting from spruce establishment on mineral soil after a flood event (succession from class B) or mixed age (succession from class D). If succession is from class D, occasional mature balsam poplar may persist in the overstory. As the spruce canopy closes, feathermoss becomes dominant on the forest floor, reaching 80% cover. Rosa acicularis, Viburnum edule and Alnus spp. may be scattered in the stand. A low shrub and herb layer may also occupy the forest floor.

This class will persist in the absence of disturbance. Flooding (probability = 0.002), represented by Option 1 in the model, causes a transition to class A. Mixed fire (MFRI = 200yrs) causes a transition to class D. Replacement fire (MFRI = 667yrs) causes a transition to class A. Insects/disease (probability = 0.02) can cause a transition to class D.

Disturbances

Fire Regime Group:** V

Historical Fire Size (acres)

Avg 0
Min 0
Max 0

Sources of Fire Regime Data

☑ Literature
☐ Local Data
☑ Expert Estimate

Fire Intervals	Avg FI	Min FI	Max FI	Probability	Percent of All Fires
Replacement	5000			0.0002	6
Mixed	312			0.00321	94
Surface					
All Fires	294			0.00342	

Fire Intervals (FI):

Fire interval is expressed in years for each fire severity class and for all types of fir combined (All Fires). Average FI is central tendency modeled. Minimum and maximum show the relative range of fire intervals, if known. Probability is the inver of fire interval in years and is used in reference condition modeling. Percent of all fires is the percent of all fires in that severity class.

Additional Disturbances Modeled

☑ Insects/Disease ☐ Native Grazing ☑ Other (optional 1) Flooding
☐ Wind/Weather/Stress ☐ Competition ☐ Other (optional 2)

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